1. A purified and isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of (1) the porcine nucleic acid sequence depicted in Figure 4 (SEQ ID NO: 7), (2) a sequence corresponding to the sequence of (1) within the scope of the degeneracy of the genetic code, (3) a sequence that encodes a porcine polypeptide having α-1,3 galactosyltransferase activity and that hybridizes under standard high stringency conditions with a sequence complementary to the sequence of (1) or (2), and (4) a sequence complementary to the sequence of (1), (2) or (3).

2. A host cell that is transformed with the nucleic acid molecule of claim 1.

3. A porcine α-1,3 galactosyltransferase encoded by the nucleic acid molecule of claim 2.

4. A DNA construct useful for inactivating the porcine α-1,3 galactosyltransferase gene by insertion of a desired DNA sequence into an insertion site of said gene, comprising said desired DNA sequence flanked by first and second homology sequences, said first and second homology sequences being, respectively, sufficiently homologous to first and second genomic sequences flanking said insertion site to allow for homologous recombination of said DNA construct with said porcine α-1,3 galactosyltransferase gene when said DNA construct is introduced into a porcine cell having said α-1,3 galactosyltransferase gene.

5. The DNA construct of claim 4, wherein said insertion site is within exon 4, exon 7, exon 8 or exon 9 of the porcine α-1,3 galactosyltransferase gene.

6. The DNA construct of claim 4, wherein said desired DNA sequence is selected from the group consisting of the neo^R gene, the hyg^R gene and the thymidine kinase gene.

7. The DNA construct of claim 6, wherein said desired DNA sequence is bordered at the 5′ and 3′ ends by FRT DNA elements, and wherein stop codons for each of the three reading frames have been inserted 3′ to the desired DNA sequence.

8. A DNA construct useful for inactivating the murine α-1,3 galactosyltransferase gene by insertion of a desired DNA sequence into an insertion site of said gene, comprising said desired DNA sequence flanked by first and second homology sequences, said first and second homology sequences being, respectively, sufficiently homologous to first and second genomic sequences flanking said insertion site to allow for homologous recombination of said DNA construct with said murine α-1,3 galactosyltransferase gene when said DNA construct is introduced into a murine cell having said α-1,3 galactosyltransferase gene.

9. The DNA construct of claim 8, wherein said insertion site is within exon 4, exon 7, exon 8 or exon 9 of the murine α-1,3 galactosyltransferase gene.

10. The DNA construct of claim 8, wherein said desired DNA sequence is selected from the group consisting of the neo^R gene, the hyg^R gene and the thymidine kinase gene.

11. The DNA construct of claim 10, wherein said desired DNA sequence is bordered at the 5′ and 3′ ends by FRT DNA elements, and wherein stop codons for each of the three reading frames have been inserted 3′ to the desired DNA sequence.

12. A method for generating a mammalian totipotent cell having at least one inactivated α-1,3 galactosyltransferase allele, said totipotent cell derived from a mammalian species having a functional α-1,3 galactosyltransferase gene, comprising:

(a) providing a plurality of cells characterized as totipotent cells of said mammalian species;

(b) introducing into said totipotent cells a nucleic acid construct effective for inactivating said α-1,3 galactosyltransferase gene by insertion of a desired DNA sequence into an insertion site of said gene through homologous recombination; and

(c) identifying a totipotent cell having at least one inactivated α-1,3 galactosyltransferase allele.

13. The method of claim 12 in which said totipotent cell is a murine ES cell.

14. The method of claim 12 in which said totipotent cell is a murine egg.

15. The method of claim 12 in which said totipotent cell is a porcine ES cell.

16. The method of claim 12 in which said totipotent cell is a porcine PGC.

17. The method of claim 12 in which said totipotent cell is a porcine egg.

18. A method for generating a mammal lacking a functional α-1,3 galactosyltransferase gene, said mammal belonging to a species having a functional α-1,3 galactosyltransferase gene, comprising:

(a) providing a mammalian totipotent cell having at least one inactivated α-1,3 galactosyltransferase allele, said totipotent cell derived from a mammalian species having a functional α-1,3 galactosyltransferase gene;

(b) manipulating said totipotent cell such that mitotic descendants of said cell constitute all or part of a developing embryo;

(c) recovering a neonate derived from said embryo; and

(d) raising and breeding said neonate to obtain a mammal homozygous for said inactivated α-1,3 galactosyltransferase allele.

19. The method of claim 18, wherein said totipotent cell is a murine ES cell and said manipulating comprises injecting said ES cell into the blastocyst cavity of a murine blastocyst and implanting said injected blastocyst into a murine recipient female.

20. The method of claim 18, wherein said totipotent cell is a murine egg, and said manipulating comprises implanting said egg into a murine recipient female.

21. The method of claim 18, wherein said totipotent cell is a porcine ES cell and said manipulating comprises injecting said ES cell into the blastocyst cavity of a porcine blastocyst and implanting said injected blastocyst into a porcine recipient female.

22. The method of claim 18, wherein said totipotent cell is a porcine ES cell and said manipulating comprises injecting said ES cell into a porcine morula.

23. The method of claim 18, wherein said totipotent cell is a porcine ES cell and said manipulating comprises co-culture of said ES cell with a zona pellucida-disrupted porcine morula.

24. The method of claim 18, wherein said totipotent cell is a porcine ES cell and said manipulating comprises fusing said ES cell with an enucleated porcine zygote.

25. The method of claim 18, wherein said totipotent cell is a porcine egg, and said manipulating comprises implanting said egg into a porcine recipient female.

26. A mammal lacking a functional α-1,3 galactosyltransferase gene, said mammal belonging to a species having a functional α-1,3 galactosyltransferase gene, said mammal produced by the method of claim 18.

27. The mammal of claim 26, wherein said mammal is a mouse.

28. The mammal of claim 26, wherein said mammal is a pig.

29. A non-naturally occurring mammal lacking a functional α-1,3 galactosyltransferase gene, said mammal belonging to a species having a functional α-1,3 galactosyltransferase gene.

30. The mammal of claim 29, wherein said mammal is a mouse.

31. The mammal of claim 29, wherein said mammal is a pig.

32. A purified and isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of (1) the nucleic acid sequence depicted in Figure 26 (SEQ ID NO: 25), (2) a sequence corresponding to the sequence of (1) within the scope of the degeneracy of the genetic code, (3) a sequence that encodes murine T-LIF and that hybridizes under standard high stringency conditions with a sequence complementary to the sequence of (1) or (2), and (4) a sequence complementary to the sequence of (1), (2) or (3).

33. A host cell that is transformed with the nucleic acid molecule of claim 32.

34. A murine T-LIF polypeptide encoded by the nucleic acid molecule of claim 32.

35. A purified and isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of (1) the nucleic acid sequence depicted in Figure 27 (SEQ ID NO: 31), (2) a sequence corresponding to the sequence of (1) within the scope of the degeneracy of the genetic code, (3) a sequence that encodes human T-LIF and that hybridizes under standard high stringency conditions with a sequence complementary to the sequence of (1) or (2), and (4) a sequence complementary to the sequence of (1), (2) or (3).

36. A host cell that is transformed with the nucleic acid molecule of claim 35.

37. A human T-LIF polypeptide encoded by the nucleic acid molecule of claim 35.

38. A method for eliminating or reducing hyperacute rejection of non-primate mammalian cells, tissues and organs by human serum, comprising adding, to said human serum, a physiologically acceptable amount of galactose or a saccharide in which the terminal carbohydrate is an α galactose linked at position 1, prior to exposure of said human serum to said non-primate cells, wherein said amount of galactose or saccharide is sufficient to reduce or eliminate said hyperacute rejection.

39. The method of claim 38, wherein said saccharide is selected from the group consisting of melibiose, galactose α1-3 galactose and stachyose.

40. A method for eliminating or reducing hyperacute rejection of non-primate mammalian cells, tissues and organs by human serum, comprising substantially depleting said serum of immunoglobulin.

41. A method for eliminating or reducing hyperacute rejection of non-primate mammalian cells, tissues and organs by human serum, comprising substantially depleting said serum of IgM antibodies.

42. A method for eliminating or reducing hyperacute rejection of non-primate mammalian cells by human serum, comprising substantially depleting said serum of anti-GAL IgM and IgG antibodies.

43. A method for eliminating or reducing hyperacute rejection of non-primate mammalian cells by human serum, comprising substantially depleting said serum of anti-GAL IgM antibodies.

44. Affinity-treated human serum substantially free of anti-GAL antibodies.

45. Affinity-treated human serum substantially free of anti-GAL IgM antibodies.